THE UNIVERSITY OF CHICAGO

DEPARTMENT OF THE GEOPHYSICAL SCIENCES

NASA Grant No. NAG 2-237: FINAL TECHNICAL REPORT

Period covered: May 1, 1983 through November 14, 1989

Project title: The Fossil Record of Extinction: Analysis of Extinction

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Virtually all plant and animal species that have ever lived on earth are now extinct and there is ample evidence that solar system and/or galactic events have played a role in species death. (See NASA SP-478 for review.) Inspired by this record, the research carried out under NAG 2-237 investigated a wide variety of issues dealing with the geologic history of biological extinction. Critical questions included: (1) Can the link between the evolution of advanced life and earth's cosmic environment be confirmed? (2) If so, how has the cosmic influence affected the course of biological evolution? and (3) What does this tell us about the possibilities for life elsewhere in the universe and how should NASA's search strategies be modified?

Some progress was made on these questions and we now know a lot more about the extinction phenomenon than ever before. Many of the analyses were statistical in nature and were based on data compiled by J. J. Sepkoski with NASA support. But the research ranged rather widely to include cognate problems such as the association between the extinction record and the earth's magnetic reversal history and the record of impact craters.

The research included several important collaborations with other investigators. In addition to that with Sepkoski (above), collaborations resulting in publication included those with Professor J. S. Trefil (physicist at George Mason University), Professor D. Jablonski (paleontologist at Chicago), Dr. D. W. McShea (graduate student, now a post-doctoral fellow at the Univertsity of Michigan), and Dr. G. E. Boyajian (graduate student, now on the faculty of the University of Pennsylvania).

The results of the research have been reported in the publications listed below. Many of these deal with the possibility that major extinction events of the last 250 million years are regularly periodic. The first paper listed below (with Sepkoski, 1984) presented a preliminary description of this periodicity and the final paper on the list (Raup, 1990) is a review of the many subsequent analyses of the data. Periodicity remains a controversial finding, the resolution of which awaits better dating of extinction events on earth and a fuller chronology of comet and asteroid impacts on earth, moon, and terrestrial planets.

Publications resulting from Grant no. NAG 2-237:

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Bambach, R.K., Briggs, J.C., Clemens, W.A., Niklas, K.J., Padian, K., Raup, D.M., Raven, P.H., Sepkoski, J.J.,Jr., and Valentine, J.W. (1985) Geologic history of complex organisms, in THE EVOLUTION OF COMPLEX AND HIGHER ORGANISMS, (Milne, D.H., Raup, D.M., Billingham, J., Niklas, K., & Padian, K., editors) NASA SP-478, p. 27-65.

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